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McGraw-Hill DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS

Fourth Edition



Sybil P. Parker

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On the cover: Pattern produced from white light by a computer-generated diffraction plate containing 529 square apertures arranged in a 23 x 23 array.
(R. B. Hoover, Marshall Space Flight Center)

On the title pages: Aerial photograph of the Sinai Peninsula made by Gemini spacecraft. (NASA)

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McGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS,

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animals, with a readout or display relatively unaffected by the pulse or movements of the animal { 'an-ə-məl, bāl-əns } **animal black** [CHEM] Finely divided carbon made by calcination of animal bones or ivory; used for pigments, decolorizers, and purifying agents; varieties include bone black and ivory black { 'an-ə-məl, blāk }

animal charcoal [CHEM] Charcoal obtained by the destructive distillation of animal matter at high temperatures; used to adsorb organic coloring matter { 'an-ə-məl 'chär-kōl }

animal communication [PSYCH] The discipline within the field of animal behavior that deals with the receipt and use of signals by animals. { 'an-ə-məl kā,myū-nā-kā-shən }

animal community [ECOL] An aggregation of animal species held together in a continuous or discontinuous geographic area by ties to the same physical environment, mainly vegetation { 'an-ə-məl kā'myū-nāt-ē }

animal ecology [ECOL] A study of the relationships of animals to their environment. { 'an-ə-məl ī-kāl-ə-jē }

animal fiber [TEXT] A natural textile fiber of animal origin; wool and silk are the most important. { 'an-ə-məl, fībər }

animal glue [MATER] A glue made from the bones, hide, horns, and connective tissues of animals { 'an-ə-məl, glū }

animal husbandry [AGR] A branch of agriculture concerned with the breeding and feeding of domestic animals { 'an-ə-məl 'haz-bəndrē }

Animalia [SYST] The animal kingdom { ,an-ə-məl yə }

animal kingdom [SYST] One of the two generally accepted major divisions of living organisms which live or have lived on earth (the other division being the plant kingdom) { 'an-ə-məl, kīngdəm }

animal locomotion [ZOO] Progressive movement of an animal body from one point to another { 'an-ə-məl, lōkō-mō-shən }

animal oil See bone oil { 'an-ə-məl, əil }

animal pole [CYTOL] The region of an ovum which contains the least yolk and where the nucleus gives off polar bodies during meiosis. { 'an-ə-məl, pōl }

animal power [MECH ENG] The time rate at which muscular work is done by a work animal, such as a horse, bullock, or elephant. { 'an-ə-məl, paôr }

animal virus [VIROL] A small infectious agent able to propagate only within living animal cells { 'an-ə-məl, vírəs }

Animikean [GEOL] The middle subdivision of Proterozoic geologic time. Also known as Penokean; Upper Huronian { ə-nim'ē-kē-ən }

animikite [GEOL] An ore of silver, composed of a mixture of sulfides, arsenides, and antimonides, and containing nickel and lead; occurs in white or gray granular masses. { ə-nim'ē-ki-tē }

anion [CHEM] An ion that is negatively charged { 'a-nī-ən }

anion exchange [CHEM] A type of ion exchange in which the immobilized functional groups on the solid resin are positive. { 'a-nī-ən iks'chānж }

anionic detergent [MATER] A class of detergents having a negatively charged surface-active ion, such as sodium alkylbenzene sulfonate. { 'a-nī-ən ik dī-tār-jānt }

anionic polymerization [ORG CHEM] A type of polymerization in which Lewis bases, such as alkali metals and metallic alkyls, act as catalysts { 'a-nī-ən ik pā-lim-rā-rā-shən }

anionotropy [CHEM] The breaking off of an ion such as hydroxyl or bromide from a molecule so that a positive ion remains in a state of dynamic equilibrium { 'a-nī-ə-nā-trō-pē }

Anisakidae [INV ZOO] A family of parasitic roundworms in the superfamily Ascaridoidea. { ,an-ə-sāk-ə-dē }

anisaldehyde [ORG CHEM] $C_6H_4(OCH_3)CHO$ A compound with melting point 2.5°C, boiling point 249.5°C; insoluble in water, soluble in alcohol and ether; used in perfumery and flavoring, and as an intermediate in production of antihistamines { 'a-nās'äl dā-hīd }

anise [BOT] The small fruit of the annual herb *Pimpinella anisum* in the family Umbelliferae; fruit is used for food flavoring, and oil is used in medicines, soaps, and cosmetics. { 'ā-nēs }

Anisian [GEOL] Lower Middle Triassic geologic time { 'ā-nīs-ē-ən }

anisic acid [ORG CHEM] $CH_3OC_6H_4COOH$ White crystals or powder with a melting point of 184°C; soluble in alcohol

and ether; used in medicine and as an insect repellent and ovicide. { 'ā-nīs ik 'ās-əd }

anisic alcohol [ORG CHEM] $C_6H_{10}O_2$ A colorless liquid that boils in the range 255–265°C; it is obtained by reduction of anisic aldehyde; used in perfumery, and as an intermediate in the manufacture of pharmaceuticals. { 'ā-nīs-ik 'al-kā-hōl }

anisocarpous [BOT] Referring to a flower whose number of carpels is different from the number of stamens, petals, and sepals. { 'ā-nīs-ə-kär-pəs }

anisochela [INV ZOO] A chelate sponge spicule with dissimilar ends. { 'ā-nīs-ə-kēl-ə }

anisocytosis [MED] A condition in which the erythrocytes show a considerable variation in size due to excessive quantities of hemoglobin. { 'ā-nīs-ə-sī-tō-sēs }

anisodactylous [VERT ZOO] Having unequal digits, especially referring to birds with three toes forward and one backward. { 'ā-nīs-ə-dāk-tə-ləs }

anisodesmic [MINERAL] Pertaining to crystals or compounds in which the ionic bonds are unequal in strength. { 'ā-nīs-ə-dez-mik }

anisogamete See heterogamete { 'ā-nīs-ə-gā-mētē }

anisogamy See heterogamy { 'ā-nīs-ə-gā-mē }

anisole [ORG CHEM] $C_6H_5OCH_3$ A colorless liquid that is soluble in ether and alcohol, insoluble in water; boiling point is 155°C; vapors are highly toxic; used as a solvent and in perfumery { 'ā-nīs-ə-sōl }

anisomerous [BOT] Referring to flowers that do not have the same number of parts in each whorl { ,ā-nī-sām-ə-rəs }

anisometric particle [VIROL] Any unsymmetrical, rod-shaped plant virus. { 'ā-nī-sō-mē-trik 'pār-tī-kəl }

Anisomyaria [INV ZOO] An order of mollusks in the class Bivalvia containing the oysters, scallops, and mussels. { ,ā-nī-sō-mī-ə-rē-ə }

anisophyllous [BOT] Having leaves of two or more shapes and sizes. { 'ā-nī-sō-sī-fil-əs }

Anisoptera [INV ZOO] The true dragonflies, a suborder of insects in the order Odonata. { ,ā-nī-sōp-tō-rə }

anisostemonous [BOT] Referring to a flower whose number of stamens is different from the number of carpels, petals, and sepals. { 'ā-nī-sō-stē-mō-nəs }

Anisotomidae [INV ZOO] An equivalent name for Leiodidae. { 'ā-nī-sō-tōm-ə-dē }

anisotropic [PHYS] Showing different properties as to velocity of light transmission, conductivity of heat or electricity, compressibility, and so on, in different directions. Also known as aeolotropic. { 'ā-nī-sā-trō-pik }

anisotropic membrane [CHEM ENG] An ultrafiltration membrane which has a thin skin at the separating surface and is supported by a spongy sublayer of membrane material { 'ā-nī-sā-trō-pik 'mē-mbrān }

anisotropy [ASTRON] The departure of the cosmic microwave radiation from equal intensity in all directions [BOT] The property of a plant that assumes a certain position in response to an external stimulus. [PHYS] The characteristic of a substance for which a physical property, such as index of refraction, varies in value with the direction in or along which the measurement is made. Also known as aeolotropy; colotropy [ZOO] The property of an egg that has a definite axis or axes { 'ā-nī-sā-trō-pē, kān-stōn }

anisotropy constant [ELECTROMAG] In a ferromagnetic material, temperature-dependent parameters relating the magnetization in various directions to the anisotropy energy { 'ā-nī-sā-trō-pē, kān-stōn }

anisotropy energy [ELECTROMAG] Energy stored in a ferromagnetic crystal by virtue of the work done in rotating the magnetization of a domain away from the direction of easy magnetization. { 'ā-nī-sā-trō-pē, ē-n ār-jē }

anisotropy factor See dissymmetry factor { 'ā-nī-sā-trō-pē, fāk-tōr }

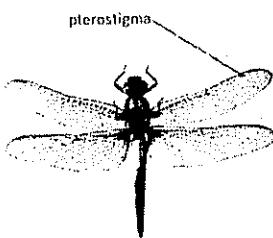
ankaramite [PETR] A mafic olivine basalt primarily composed of pyroxene with smaller amounts of olivine and plagioclase and accessory biotite, apatite, and opaque oxides. { 'ā-nī-kā-rā-mīt }

ankaratrite See olivine nephelinite { ,ā-nī-kā-rā-tīt }

anker [MECH] A unit of capacity equal to 10 U.S. gallons (37.854 liters); used to measure liquids, especially honey, oil, vinegar, spirits, and wine { 'āng-kōr }

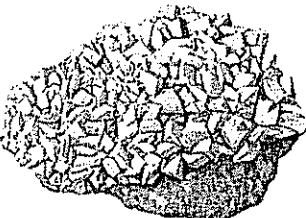
ankerite [MINERAL] $Ca(Fe,Mg,Mn)(CO_3)_2$ A white, red, or gray iron-rich carbonate mineral associated with iron ores

ANISOPTERA



An adult dragonfly, showing the thickened spot, pterostigma, on the costal margin of the wing.

ANKERITE



A specimen of ankerite. (Specimen from Department of Geology, Bryn Mawr College)

an electron tube in an oscillator circuit { i'lek,trän ,tüb 'jen ,ə,räd'är }

electron-tube heater See heater { i'lek,trän ,tüb 'hēd'är }

electron-tube static characteristic [ELECTR] Relation between a pair of variables such as electrode voltage and electrode current with all other voltages maintained constant { i'lek,trän ,tüb 'stāt'ik kar'ik tā'stik }

electron tunneling [QUANT MECH] The passage of electrons through a potential barrier which they would not be able to cross according to classical mechanics, such as a thin insulating barrier between two superconductors { i'lek,trän 'tān'əl īg }

electronuclear breeder See linear accelerator breeder { i,lek'trō'nūklē'är 'brēd'är }

electron vacuum gage [ENG] An instrument used to measure vacuum by the ionization effect that an electron flow (from an incandescent filament to a charged grid) has on gas molecules. { i'lek,trän 'vak'yūm ,gāj }

electron volt [PHYS] A unit of energy which is equal to the energy acquired by an electron when it passes through a potential difference of 1 volt in a vacuum; it is equal to $(1.602192 \pm 0.000007) \times 10^{-19}$ volt. Abbreviated eV { i'lek,trän ,vōlt }

electron wave [QUANT MECH] The de Broglie wave or probability amplitude wave of an electron { i'lek,trän ,wāv }

electron wave function [QUANT MECH] Function of the spin orientation and position of one or more electrons, specifying the dynamical state of the electrons; the square of the function's modulus gives the probability per unit volume of finding electrons at a given position. { i'lek,trän ,wāv ,fān'kshōn }

electron wavelength [QUANT MECH] The de Broglie wavelength of an electron, given by Planck's constant divided by the momentum. { i'lek,trän 'wāv ,leg'kth }

electrooptical birefringence See electrooptical Kerr effect { i,lek'trō'äp'tō-käl bī'rēfrin'jəns }

electrooptical character recognition See optical character recognition { i,lek'trō'äp'tō-käl 'kar'ik rōt' ,rek'ig,nish'ən }

electrooptical Kerr effect [OPTICS] Birefringence induced by an electric field. Also known as electrooptical birefringence; Kerr effect. { i,lek'trō'äp'tō-käl 'kōr' ,fek't }

electrooptical modulator [COMMUN] An optical modulator in which a Kerr cell, an electrooptical crystal, or other signal-controlled electrooptical device is used to modulate the amplitude, phase, frequency, or direction of a light beam. { i,lek'trō'äp'tō-käl 'mūj'ə ,läd'är }

electrooptic material [OPTICS] A material in which the indices of refraction are changed by an applied electric field { i,lek'trō'äp'tik mö'tir'ēət }

electrooptic radar [ENG] Radar system using electrooptic techniques and equipment instead of microwave to perform the acquisition and tracking operation { i,lek'trō'äp'tik 'rā,dār }

electrooptics [OPTICS] The study of the influence of an electric field on optical phenomena, as in the electrooptical Kerr effect and the Stark effect. Also known as optoelectronics. { i,lek'trō'äp'tiks }

electroosmosis [PHYS CHEM] The movement in an electric field of liquid with respect to colloidal particles immobilized in a porous diaphragm or a single capillary tube. { i,lek'trō'äs'mōs'əs }

electroosmotic driver [ELECTR] A type of solion for converting voltage into fluid pressure, which uses depolarizing electrodes sealed in an electrolyte and operates through the streaming potential effect. Also known as micropump { i,lek'trō'äz'mäd'ik 'driv'ər }

electropainting [ENG] Electrolytic deposition of a thin layer of paint on a metal surface which is made an anode { i'lek'trō,pānt'ig }

electropherography See electrochromatography { i'lek'trō-fā'rāg'ra'fē }

electrophile [PHYS CHEM] An electron-deficient ion or molecule that takes part in an electrophilic process { i'lek'trō,fīl }

electrophilic [PHYS CHEM] 1. Pertaining to any chemical process in which electrons are acquired from or shared with other molecules or ions. 2. Referring to an electron-deficient species. { i'lek'trō'fīl'ik }

electrophilic reagent [PHYS CHEM] A reactant which accepts an electron pair from a molecule, with which it forms a covalent bond. { i'lek'trō,fīl'ik rē'əjōnt }

electrophonic effect [BIOPHYS] The sensation of hearing

produced when an alternating current of suitable frequency and magnitude is passed through a person { i,lek'trōfā'sēn'ik i'fēkt }

electrophoresis [PHYS CHEM] An electrochemical process in which colloidal particles or macromolecules with a net electric charge migrate in a solution under the influence of an electric current. Also known as cataphoresis. { i,lek'trōfā'res'əs }

electrophoretic coating [MET] A surface coating on a metal deposited by electric discharge of particles from a colloidal solution. { i,lek'trōfā'red'ik 'kōd'īg }

electrophoretic display [OPTICS] A liquid crystal display in which a light-absorbing dye has been added to the liquid to improve both color and luminance contrast. { i,lek'trōfā'red'ik di'splā }

electrophoretic effect [PHYS CHEM] Retarding effect on the characteristic motion of an ion in an electrolytic solution subjected to a potential gradient, which results from motion in the opposite direction by the ion atmosphere { i,lek'trōfā'red'ik i'fēkt }

electrophoretic mobility [BIOCHEM] A characteristic of living cells in suspension and biological compounds (proteins) in solution to travel in an electric field to the positive or negative electrode, because of the charge on these substances { i,lek'trōfā'red'ik mö'bil'ēd'ē }

electrophoretic variants [BIOCHEM] Phenotypically different proteins that are separable into distinct electrophoretic components due to differences in mobilities; an example is erythrocyte acid phosphatase { i,lek'trōfā'red'ik 'ver'ēəns }

electrophorus [ELEC] A device used to produce electric charges; it consists of a hard-rubber disk, which is negatively charged by rubbing with fur, and a metal plate, held by an insulating handle, which is placed on the disk; the plate is then touched with a grounded conductor, so that negative charge is removed and the plate has net positive charge. { i,lek'trōfā'ros }

electrophotograph [GRAPHICS] An image formed by means of an electrostatic copying system. { i,lek'trōfō'də,grāf }

electrophotography [GRAPHICS] An electrostatic image-forming process in which light, x-rays, or gamma rays form an electrostatic image on a photoconductive, insulating medium; the charged image areas attract and hold a fine powder called a toner, and the powder image is then transferred to paper or fused there by heat. { i,lek'trōfō'tāg rō'sē }

electrophotoluminescence [ELECTR] Emission of light resulting from application of an electric field to a phosphor which is concurrently, or has been previously, excited by other means. { i,lek'trōfō'dō,lū'mō'nēs'əns }

electrophrenic respiration [MED] Artificial respiration in which the nerves that control breathing are stimulated electrically through appropriately placed electrodes. { i,lek'trōfren'ik ,rē'spā'rā'shōn }

electrophysiology [PHYSIO] The branch of physiology concerned with determining the basic mechanisms by which electric currents are generated within living organisms { i,lek'trōfiz'ēəl'ärjē }

electroplating [MET] Electrodeposition of a metal or alloy from a suitable electrolyte solution; the article to be plated is connected as the cathode in the electrolyte solution; direct current is introduced through the anode which consists of the metal to be deposited. { i,lek'trō,plād'īg }

electroplax [VERT ZOO] One of the structural units of an electric organ of some fishes, composed of thin, flattened plates of modified muscle that appear as two large, waferlike, roughly circular or rectangular surfaces { i'lek'trō,plāks }

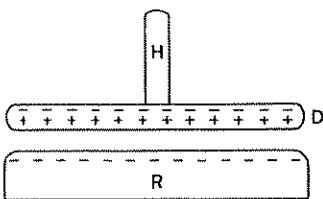
electropolishing [MET] Smoothing and enhancing the appearance of a metal surface by making it an anode in a suitable electrolyte. Also known as electrolytic brightening; electrolytic polishing. { i'lek'trō,pāl'ōshēn }

electropositive [ELEC] 1. Carrying a positive electric charge. 2. Capable of acting as the positive electrode in an electric cell. [PHYS CHEM] Pertaining to elements, ions, or radicals that tend to give up or lose electrons { i,lek'trō,pāz'əd'iv }

electropositive potential [PHYS CHEM] Potential of an electrode expressed as positive with respect to the hydrogen electrode { i,lek'trō,pāz'əd'iv pō'tēnch'əl }

electropulse engine [AERO ENG] An engine, for propelling a flight vehicle, that is based on the use of spark discharges through which intense electric and magnetic fields are estab-

ELECTROPHORUS



An electrophorus; when the metal plate *D* with insulating handle *H* is placed on the rubber plate *R*, charge is induced as shown.

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monoenergetic

abbr.: MWC model; a model describing the nature of allosteric interactions in proteins. It requires an allosteric protein to be an oligomer, the protomers of which are associated in such a way that they all occupy equivalent positions. Each protomer has only one stereospecific binding site for each ligand. The protein can exist in either of two conformational states, the T form (tense form), the predominant form when unligated, and the R form (relaxed form); these states are in equilibrium. The affinity of the R form for ligand is higher than that of the T form. All binding sites in each state are deemed to be equivalent and to have identical dissociation constants, K_R and K_T for the R and T forms, respectively. The sigmoidal binding curve for any allosteric protein and a given ligand can be calculated from the allosteric constant, L , equal to the ratio [T form]/[R form] for the unligated states and the two dissociation constants. [After J. Monod, Jeffries Wyman (1901-95), US biochemist, and Jean-Pierre Changeux (1936-), French biochemist.] See also mnemonic enzyme mechanism.

monoenergetic or **monochromatic** (of moving particles and sometimes also photons) all having the same kinetic energy.

monoenoic denoting any alkenyl carboxylic acid containing one carbon-carbon double bond per molecule.

monoester any simple ester; i.e. any ester formed by condensation of one molecular proportion of an alcohol or phenol with one of an oxoacid.

monoesterase see phosphomonooesterase.

monofunctional having only one function or one reactive chemical group.

monoglyceride a former name for monoacylglycerol; its use is discouraged as it does not convey the intended meaning.

monognotobiotic an alternative term for axenic.

monohydric or **monohydroxy** describing any chemical compound containing one hydroxyl group per molecule. It is used especially of alcohols.

monoiodinated reacted with or containing only one atom of iodine per molecule.

monokine an alternative name for a cytokine produced by monocytes.

monolayer 1 an alternative name for monomolecular layer. 2 a single layer of cells grown or growing in culture.

monomer 1 any substance that can provide one or more (in number or species) of the monomeric units of an oligomer (def. 1) or of a polymer (def. 1); a molecule of such a substance 2 a loose term for any of the component molecules (identical or nonidentical) formed by the complete dissociation of a macromolecule with quaternary structure. 3 (in molecular biology) a any protein that is made up of nonidentical structural units. b any of the structural units formed by dissociation of an oligomeric protein and corresponding to a protomer in the undissociated protein. —monomeric *adj.*

monomeric unit a group of atoms, derived from a molecule of a given monomer (def. 1), that comprises any one species of constitutional unit of a polymer.

monomolecular 1 relating to, consisting of, or involving a singular molecular entity. 2 (of a reaction) having a molecularity of one; unimolecular.

monomolecular layer or **monolayer** a layer of a substance or substances that is one molecule thick.

mononuclear 1 (of a cell) having one nucleus. 2 (of a metal-ion-ligand complex) containing a single central metal atom.

mononuclear phagocyte system a cell system in higher animals that comprehends all the highly phagocytic mononuclear cells and their precursors. As well as the free macrophages, it includes precursor cells and promonocytes of the bone marrow, monocytes of the bone marrow and the blood, and the tissue macrophages. The term has been proposed as a replacement for reticuloendothelial system, now held to lack precision.

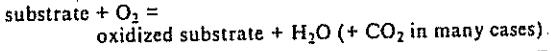
mononucleosis see Epstein-Barr virus.

mononucleotide any nucleotide (def. 1); the term is used especially as the generic name of the constitutional repeating unit of all oligonucleotides, polynucleotides, and nucleic acids. A

monosaccharide

mononucleotide consists of the (3'- or 5')phosphate of a single ribonucleoside or deoxyribonucleoside. The term is extended generally to include: (1) nucleoside oligophosphates, e.g. adenosine 5'-triphosphate (ATP); (2) nucleoside diphosphate sugars, e.g. uridine 5'-diphosphate glucose (UDPG); (3) nucleoside 2',3'- and 3',5'-(cyclic)phosphates, e.g. adenosine 3',5'-phosphate (cyclic AMP); (4) nucleoside phosphates derived from artificial heterocyclic bases, e.g. 5-iodo-2'-deoxycytidine 5'-triphosphate, or from ones that do not occur naturally in nucleic acids, e.g. inosine 5'-phosphate (i.e. inosinic acid); hypoxanthine riboside 5'-phosphate; IMP); and (5) certain analogous compounds such as those containing, in place of a residue of ribose or deoxyribose, a residue of ribitol, e.g. flavin mononucleotide (i.e. riboflavin 5'-phosphate; FMN), of dideoxyribose, e.g. 2',3'-dideoxyadenosine 5'-triphosphate (i.e. ddATP), or of another pentose, e.g. cytosine arabinoside 5'-triphosphate (i.e. ara-CTP). Compare oligonucleotide, polynucleotide.

monooxygenase any oxidoreductase enzyme that brings about the incorporation of only one atom of oxygen from dioxygen into the donor; such enzymes catalyse reactions of the type:



The following are examples. (1) Lysine 2-monooxygenase; EC 1.13.12.2; it catalyses the oxidation by dioxygen of L-lysine to 5-aminopentanamide, CO_2 , and H_2O ; FAD is a coenzyme. (2) Lysine 6-monooxygenase; EC 1.13.12.10; it catalyses the oxidation by dioxygen of L-lysine to N^6 -hydroxy-L-lysine and H_2O . (3) Tryptophan 2-monooxygenase; EC 1.13.12.3; it catalyses the oxidation by dioxygen of L-tryptophan to indole-3-acetamide, CO_2 , and H_2O . (4) *myo*-Inositol oxygenase; EC 1.13.99.1; it catalyses the oxidation by dioxygen of *myo*-inositol to D-glucuronate and H_2O ; iron is a cofactor. (5) Phenol 2-monooxygenase; EC 1.14.13.7; other name: phenol hydroxylase; it catalyses a reaction between phenol, NADPH, and O_2 to form catechol, NADP^+ , and H_2O ; FAD is a coenzyme. It is an enzyme of bacterial aromatic substrate utilization; example from *Pseudomonas pickettii*; database code: TBUD_PSEPI, 670 amino acids (72.79 kDa). (6) *trans*-Cinnamate 4-monooxygenase; EC 1.14.13.11; other names: cinnamic acid 4-hydroxylase; cinnamate 4-hydroxylase; CA4H; it catalyses a reaction between *trans*-cinnamate, NADPH, and O_2 to form 4-hydroxycinnamate, NADP^+ , and H_2O . It is a cytochrome P450-thiolate enzyme; example from Jerusalem artichoke; database code: TCMO_HELTU, 505 amino acids (57.85 kDa). See also monophenol monooxygenase.

monophenol monooxygenase EC 1.14.18.1; other names: tyrosinase; phenolase; monophenol oxidase; cresolase. An enzyme involved in the formation of melanins and other polyphenolic pigments, etc. It catalyses a reaction between L-tyrosine, L-dopa, and O_2 to form L-dopa, dopaquinone, and H_2O ; copper is a cofactor. It has four motifs, three for the Cu site. Example from human (precursor): TYRO_HUMAN, 529 amino acids (60.33 kDa). Deficiency results in albinism.

monophosphatidyl glycerol any [1,2-diacyl-sn-glycero-3-(phospho-L-sn-glycerol)] lipid present in chloroplasts of higher plants.

monoploid (of cells or individuals) having a single set of chromosomes; i.e. in a polyploid series, having the fundamental haploid chromosome number; true haploid.

monosaccharide the generic name of the simplest carbohydrates. Monosaccharides cannot be hydrolysed to give smaller carbohydrates. They are polyhydric alcohols containing either (in aldoses) an aldehyde group or (in ketoses) a keto group and with from three to ten or more carbon atoms. Monosaccharides form the constitutional repeating units of oligo- and polysaccharides. The names and structures of the common aldoses (from triose to hexose) form the basis for prefixes used to describe other compounds containing a set of

EXHIBIT 7

GRANT & HACKH'S CHEMICAL DICTIONARY

[*American, International, European and British Usage*]

*Containing the Words Generally Used in Chemistry,
and Many of the Terms Used in the Related
Sciences of Physics, Medicine, Engineering,
Biology, Pharmacy, Astrophysics,
Agriculture, Mineralogy, etc.*

Based on Recent Scientific Literature

FIFTH EDITION
Completely Revised and Edited by

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Julius Grant from a *Chemical Dictionary* compiled by Ingo W. D.
Hackh. The current, or 5th, edition of this book was prepared by Dr.
Roger L. Grant, whose father prepared the 4th edition.

*The editors for this book were Betty J. Sun and Susan Thomas,
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supervisor was Teresa F. Leaden. It was set in Palatino
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canal rays

110

capiro(e)l

vacuum tube of about 3.2×10^9 cm/s. They produce ionization, photographic action, fluorescence, and disintegration of certain substances. Cf. ray(s), mass spectra.

cananga Ylang-ylang.

canavalia bean The urease-rich seeds of *Canavalia* species.

canavalin A globulin of jack beans, the seed of *Canavalia* species (Leguminosae).

cancer A growth of malignant tissue.

cancrinite (1) $\text{Na}_4\text{Al}_3\text{HCSi}_3\text{O}_{15}$ Yellow, hexagonal rock, d 2.4, hardness 5-6 (2) $4\text{Na}_2\text{O} \cdot \text{CaO} \cdot 4\text{Al}_2\text{O}_3 \cdot 9\text{SiO}_2 \cdot 2(\text{CO}_2 \cdot \text{SO}_3) \cdot 3\text{H}_2\text{O}$. A constituent of steam boiler scales.

candela* Abbrev. cd. An SI base unit. 1 cd is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 540×10^{12} Hz with a radiant intensity in that direction of 1/683 W per steradian. 1 lambert = 3183.1 cd/m^2 .

candelilla wax Gama wax. Brown wax, d 0.983, m 67, from the candelilla plant (Mexico); used in candles, cements, polishes, varnishes, leather dressings, and dentistry.

candicin A mixture of heptane substances with antifungal properties from *Streptomyces griseus*. Candeptin, Vanobid. Yellow powder, insoluble in water. Used for fungal infections of skin and vagina (USP, BP).

candle Abbrev. cd. Former international unit of luminous intensity. See *foot-candle, illuminance* new ~ *Candela**.

c. balance A balance to determine the burning rate of a c. c. nut oil Lumbang oil. c. power The luminous intensity of a standard candle. Practical standards are now a light of known luminous intensity relative to the candela. Traditional standards:

1 standard English sperm candle = 1 candle.

1 standard pentane lamp, burning pentane (International candle) = 10.0 candles.

1 standard Hefner lamp, burning pentyl acetate = 0.9 candle.

1 standard Carcel lamp, burning colza oil = 9.6 candles

c. standard C. made of sperm wax, weight $\frac{1}{2}$ lb, which burns 120 grains (7.776g) per hour

candoluminescence Luminescence due to incandescent heat, i.e., temperatures exceeding 1000°C. as from a hydrogen-air flame.

canella Whitewood, cinnamon bark. The bark of *Winterana canella* (Canellaceae), W. Indies; a condiment. c. oil The essential oil of c. Colorless liquid, d 0.920-0.935, containing eugenol, eucalyptol, and oleanolic acid.

cane sugar Sucrose made from sugar cane.

canfieldite Ag_8SnS A rare, native sulfide.

cannabane $\text{C}_{18}\text{H}_{22} = 238.4$ Cannabene hydride. A volatile hydrocarbon in hemp oil. Cf. *cannibene*.

cannabene $\text{C}_{18}\text{H}_{20} = 236.4$. A hydrocarbon in hemp oil.

cannabidiol $\text{C}_{21}\text{H}_{30}\text{O}_2 = 314.5$. Crystals, m 67. An isomer of cannabol in hemp resins.

cannabin (1) A glucoside, or (2) a resin, from *Cannabis indica*.

cannabine An alkaloid from cannabis; a hypnotic.

cannabinol $\text{C}_{21}\text{H}_{26}\text{O}_2 = 310.4$. The active principle of *Cannabis sativa*. Yellow oil, d 1.042, b_{100mm} 315, insoluble in water, green fluorescence in glacial acetic acid. acetyl ~ See *acetyl cannabinol*.

cannabis Indian hemp, Indian c., bhang, ganja, hashish, marihuana, pot. The flowering tops of or resin from the female plant of *C. indica* or *C. sativa*, hemp (Urticaceae). A central nervous system stimulant producing excitement, euphoria and change of mood; also a narcotic. Dependence is psychological rather than physical; withdrawal symptoms do not seem to be produced.

cannabol $\text{C}_{21}\text{H}_{30}\text{O}_2 = 314.5$. An isomer of cannabidiol in hemp resins, m. 66.5

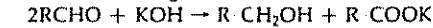
cannel coal A hard bituminous coal with a luminous flame, a smooth conchoidal fracture, and a high volatiles content. Used for gas production. Cf. *boghead, torbanite*.

cannibene $\text{C}_{15}\text{H}_{24} = 204.4$. A sesquiterpene, d 0.897, b. 259, from hemp oil. Cf. *cannabane*.

cannizzarization The Cannizzaro reaction.

Cannizzaro, Stanislao (1826-1910) Italian chemist noted for his work on organic chemistry and the amplification and application of Avogadro's hypothesis to the atomic theory.

C number The mg of potassium hydroxide which react with 1 g aldehyde in C. reaction. C. reaction The decomposition of aromatic aldehydes by alcoholic KOH, with the formation of acids and alcohols; e.g.:



cannonite A high-explosive nitrocellulose-nitroglycerin mixture.

cannula A plastic, metal, or glass tube used to connect blood vessels; also inserted into body cavities.

cantharene $\text{C}_8\text{H}_{12} = 108.2$. Dihydro-*o*-xylene. Colorless liquid, b. 135.

cantharides Blistering beetle, cantharis, Russian fly, Spanish fly, *Lyta* or *Cantharis vesicatoria*; a blistering agent.

cantharidic acid Cantharidin.

cantharidin $\text{C}_{10}\text{H}_{12}\text{O}_4 = 196.2$. Cantharis. Colorless crystals, slightly soluble in water, m 210; a blistering agent.

Cantharis A genus of beetles, now *Lyta*.

Canton phosphorus A luminescent mixture of oystersHELLS 2, sulfur 1 pt

canula Cannula.

canvas A strong, close hemp or flax fabric used in filter presses and sacking.

caoutchouc (Malaysian, "weeping tree"). Rubber. Gaboon ~ Dambonite mineral ~ See mineral *caoutchouc*.

CAP Abbreviation for chloracetophenone.

capacitance* Electric c*. An isolated capacitor has unit c when unit electrical quantity will create a unit potential difference between its plates. SI unit is the farad, q v.

capacity (1) The ability to contain a force or exert energy. (2) Volume electrostatic ~ Capacitance*. heat ~* See *heat capacity* specific inductive ~ Relative permittivity*.

thermal ~ Heat capacity*.

caparrosa The leaves of *Nea theifera* (Nyctaginaceae), S. America; a tea.

capers The green flower buds of *Capparis spinosa* (Capparidaceae), Mediterranean; a pickle and condiment.

capillaries The network of delicate blood vessels or other small tissue-connecting tubes.

capillary Capillary attraction.

capillary A tube with a very small inside diameter. c. analysis (1) Early name for chromatographic analysis. (2) A filter paper dipped into a negative colloid absorbs both the dispersed and external phase, but in a positive colloid only the external phase. Cf. *adsorption*. c. correction A correction for the capillarity of mercury applied to mercury thermometers of diameter above 25 mm. c. electrode See *Lippmann electrode*. c. electrometer See *electrometer*. c. pipet A pipet for measuring fractions of a mL. c. tubing Glass tubing with inside diameter less than 1 mm.

capillator An apparatus for the colorimetric determination of pH values in which the solutions are compared in capillary tubes, to reduce the effect of color or turbidity.

capnometry The measurement of smoke density. Cf. *nephelometry*.

capiro(e)l A disinfectant mixture of calcium hypochlorite and sodium chloride containing about 50% active chlorine.

electron

206

electrostatic

piezo ~ A supposedly disk-shaped e. in the helium nucleus
positive ~ Positron. **recoil** ~ E. scattered by bombardment of a substance with α or β rays. **secondary** ~ Auger e. E. emitted by a metal surface irradiated with X-rays of 150–200 kV. These electrons affect photographic film to extents that depend on the atomic number of the surface metal and are used in qualitative analysis. **twin** ~ See *paired electrons*. **valency** ~ Any of the electrons in the outer orbital of an atom which are responsible for valency. They can pass from one atom to the other (polar bond) or be held in common by 2 atoms (nonpolar bond). See *bond*. **valency**.

e. affinity The capture by a substance, e.g., an oxidizing agent, of the electrons of other substances. **e. beam** A stream of electrons, as in a cathode tube. **e. compounds rule** The position of the phase boundaries, at room temperature, in the equilibrium diagram of a binary alloy depends on the e. concentration. **e. configuration** The arrangement of electrons in energy levels. See Table 27 on pp. 207–208. **e. density** See *orbital*. **e. diffraction** The diffraction of a stream of electrons by a surface. Cf. *electron microscope*. **e. displacement** A shift of an e. pair held in common between 2 atomic nuclei toward one nucleus. See *Lucas theory*. **e. distribution curve** A curve showing the e. distribution among the different available energy levels. **e. exchange polymer** See *electron-exchange polymer* under *polymer*. **e. eye** Iconoscope. **e. formula** A chemical notation depicting the e. displacement in an organic compound. **e. fugacity** The tendency by an electrode in a solution to lose electrons. **e. gas** A system consisting of free electrons shared by all atoms, as in a metal; see *atomic structure*. **e. lens** The electrostatic field surrounding an aperture in a charged conductor. A circular hole will focus electrons with a focal length of $2V/(G_2 - G_1)$, where V is the energy of incident particles in volts, and G_1, G_2 are the potential gradients on the 2 sides of the plate. **e. microscope** See *electron microscope* under *microscope*. **e. optics** The control of e. motion by means of charged electric fields. Cf. *lens effect on light*. **e. pair** A pair of electrons which are held in common by 2 atoms. **e. probe analysis** Quantitative analysis by comparison of the characteristic X-ray intensities produced by a focused electron beam from the sample and from a standard. **e. screening effect** See *screening effect*. **e. spin resonance e.s.r.** A spectroscopic technique analogous to *nuclear magnetic resonance*, q.v., in which radiation of measurable frequency and wave length is used to supply energy to protons instead of to electrons. **e. transfer** The passage of one or more electrons from an atom or to an atom or ion in an oxidation-reduction reaction. **e. tube** A device for e. discharge; as, thermionic valve. **e. volt** eV. The energy acquired by an e. when it falls through a potential of one volt. $1 \text{ eV} = 1.602 \times 10^{-19} \text{ joule}$.

electronate To cause electron transfer or reduction. **de** ~ To cause oxidation.

electronation reactions Oxidation-reduction reactions.

electronegative (1) Having a negative charge or excess of electrons. (2) Capable of capturing electrons. **e. element** Elements generally located on the right side of the periodic table, especially the nonmetals. **e. ion** Anion, or negative ion. **e. radical** An acid radical or a group of atoms having a negative charge.

electronic Pertaining to electrons. **e. charge** A quantity of electricity numerically equal to the charge on a proton = $1.602 \times 10^{-19} \text{ C}$. **e. configuration of elements** See *electron configuration*. **e. formula** See *electronic formula* under *formula*. **e. mass** The mass of a negative electron

moving with a velocity much less than that of light. **e. number** The number of peripheral electrons in the elements of a compound. **e. ratio** Specific charge. **e. structure symbol** A notation showing the distribution of electrons in the molecule. See *bond*, *molecular diagrams*.

electronics Radionics. The study of the applications of semiconductors and vacuum tubes (U.K.; valves) in electric circuits.

electroosmosis Electroendosmosis. The production of osmosis through a membrane by an electric current.

electropainting Electrolytic deposition of paint in a thin layer on a metal surface, which is made the anode.

electrophilic Describing preferential attraction to regions of high electron density. Cf. *nucleophilic*.

electrophoresis The migration of suspended particles in an electric field. In particular, the accelerated chromatographic separation of compounds by immersing each end of the medium in an electrolyte and applying an electric potential. Cf. *ionophoresis*.

electrophoreogram A paper chromatograph produced by electrophoresis.

electrophorus An instrument consisting of insulated disks of ebonite and brass, used to produce frictional electricity.

electrophotography A method of photocopying in which a zinc oxide-coated paper is negatively charged by a corona discharge, exposed to light via the document which dissipates the charge locally, and developed by contact with a positively charged resinous toning powder, which is subsequently fixed by fusion.

electroplating The formation of a metallic coat on a base metal by electrolysis.

electropolishing The production of a highly polished and chemically clean surface on a stainless steel object by making it the anode in an electrolyte, to reverse the process of electroplating; about 0.01 mm is removed.

electropositive (1) Having a positive charge or a deficiency of electrons. (2) Capable of losing or giving up electrons. **e. elements** The elements on the left-hand side of the periodic table, especially the light metals. **e. ion** Cation. An atom, or a group of atoms, which has lost one or more negative electrons or gained a proton, and has become positive; as, NH_4^+ .

electropotential Electrode potential.

electrorefining The purification of metals by electrolysis.

electroresponse The increase in resistance of certain cells with increase of current.

electrorheological fluids Jammy fluids. Suspensions of fine, nonmetallic particles in oil that rapidly acquire solidlike properties when a voltage is applied across their flow. Response time to the voltage is less than 1 ms. Under voltage and stress, they creep rather than crack.

electroscope A device to detect electric charges or gaseous ions. **gold-leaf** ~ Two strips of gold leaf suspended from an insulated conductor and in a glass vessel. **measuring** ~ A gold-leaf e. which can be rotated so that an electrostatic and gravitational balance is established. The position of the leaf is read in a low-focus microscope.

electroscopy The measurement of the degree of ionization of a gas in terms of the rate of fall of the leaf of a charged gold electroscope.

electrosol A colloidal solution of a metal obtained by passing an electric discharge between metal electrodes in distilled water.

electrostatic Pertaining to electric charges at rest.

e. capacity The ratio of quantity of electricity to difference of potential. **e. law** See *Coulomb*. **e. mixing** See *electrostatic*.

EXHIBIT 8

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Edited by D. W. A. SHARP, M.A., PH.D.,
C.CHEM., F.R.S.C., F.R.S.E.

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154 electrophilic reagents

electrophilic reagents Reagents which acquire electrons or a share in electrons from the reactant molecule; examples are the bromonium ion, Br^+ and the nitronium ion, NO_2^+ . The product can frequently only accommodate the extra electrons by undergoing fission. Acidity is a special case of *electrophilicity*, the affinity for external electrons in general.

electrophilic substitution The exchange of an atom or group in a molecule for an entering electrophile according to



The nitration, sulphonation and Friedel-Crafts acylation of aromatic compounds (e.g. benzene) are typical examples of electrophilic aromatic substitution.

electrophoresis The migration of charged particles, colloidal particles or ions through a solution under an electric field. Variation of pH can stop movement at the isoelectric point*. In electro-osmosis there is a constant flow of liquid relative to a stationary surface. Electrophoresis is used in analysis, particularly in biochemical applications (ionography, zone electrophoresis, electrochromatography) for both identification and separation.

electrophoretogram The separated species on, e.g., a column after electrophoresis.

electroplating The deposition of metals from solution in the form of a layer on other metals or, e.g., plastics, by passage of an electric current. A metallic article to be plated is made one electrode in a bath containing the other metal as aquo-ions or other complexes. Current density, pH, concentration, etc. all have a very marked effect on the adhesion and texture of the deposited metal. Among metals used for electroplating are Ag, Cr, Ni, Zn.

electrostatic precipitators Plants for the removal of fine suspended matter from a gas that depend for their action on the ionization of the gas between two highly charged electrodes. The ions so formed attach themselves to the dispersed particles, conferring a charge, with the result that the latter then migrate to the appropriate electrode.

electrovalent bond, polar bond Bonding by electrostatic attraction.

electrovalent compounds Compounds in which the major binding force is electrostatic attraction between positive and negative ions. The lattice does not contain discrete molecules and the ions are packed together to occupy space most efficiently (generally close packing of anions). Electrovalent compounds are dis-

tinguished from covalent compounds by the conductivity of melts and solutions in polar solvents, low volatility, solubility in polar solvents.

element A substance which cannot be further divided by chemical methods. The basic substances which build up chemical compounds. An element is defined by its atomic number (nuclear charge and electronic configuration). The table on pp. 152-3 shows the elements and their normal, ground-state, electronic configurations.

elementary particles The fundamental particles found in nature, e.g. proton, neutron, electron.

elements, abundance of The relative abundance of elements depends on whether measurements are made on the crust, meteorites, core, etc. For the earth's crust (E) abundance of the lighter elements (expressed relative to $\text{Si} = 10^6$) are:

	E	A
O	2.96×10^6	27.17
Na	105 000	0.51
Mg	68 000	11.25
Al	300 000	1.07
Si	10^6	13.84
P	3 430	0.08
S	1 640	2.74
K	62 000	0.06
Ca	80 000	1.07
Ti	9 000	0.06
Mn	1 950	0.13
Fe	126 000	38.8
Ni	100	2.70

(A) represents the average % composition of the earth by weight.

elements of symmetry The symmetry elements, centres, axes, planes of symmetry, present in a molecule, crystal lattice or crystal. Together with the arrangement of atoms the elements of symmetry spell out the space-group* of a crystal or the point-group of a molecule.

elevation of boiling point The boiling point of a solvent is raised by the presence of a solute. For small concentrations of the solute the rise in the boiling point is proportional to the number of solute particles present in the solution. The elevation caused by 1 mole of solute in 1 litre of solvent is termed the molecular elevation constant. (See colligative properties.)

CERTIFICATE OF SERVICE

I hereby certify that on January 20, 2006, I electronically filed the foregoing document with the Clerk of Court using CM/ECF which will send notification of such filings, and hand delivered, to the following:

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